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Notes:

1. Untranslatable words are replaced with asterisks (***).
2. Texts in the figures are not translated and shown as it is.

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Dictionary: Last updated 01/13/2010 / Priority: 1. Electronic engineering / 2. Information communication technology (ICT) / 3. Technical term

FULL CONTENTS

[Claim(s)]

[Claim 1] While being filled up with resin paste in the above-mentioned through hole from a process of forming two or more through holes which penetrate between the surface and the back in a through hole formation area of the substrates to be filled up, and the above-mentioned surface side and carrying out stopgap printing, A manufacturing method of a wiring board, wherein the above-mentioned dummy printing part surrounds the above-mentioned through hole formation area at least and is formed including a process of printing the same resin paste as the above-mentioned resin paste, and forming a dummy printing part on the above-mentioned surface.

[Claim 2] A process of forming two or more through holes which penetrated between the surface and the back and where a conductor layer was formed in inner skin in a through hole formation area of the substrates to be filled up, While being filled up with resin paste in the above-mentioned through hole and carrying out stopgap printing from the above-mentioned surface side, A manufacturing method of a wiring board, wherein the above-mentioned dummy printing part surrounds the above-mentioned through hole formation area at least and is formed including a process of printing the same resin paste as the above-mentioned resin paste, and forming a dummy printing part on the above-mentioned surface.

[Claim 3] A manufacturing method of the wiring board according to claim 1 or 2, wherein the above-mentioned dummy printing part consists of two or more island-shape resin paste groups.

[Claim 4] A manufacturing method of the wiring board according to any one of claims 1 to 3 for which the above-mentioned dummy printing part is characterized by forming density of a through hole also in a field of a non-dense in in the above-mentioned through hole formation area.

[Detailed Description of the Invention]

[0001]

[Field of the Invention] When this invention hardens the resin paste with which the through hole of the substrate to be filled up was especially filled up about the manufacturing method of the wiring board which fills up with and makes up for resin paste, it relates to the manufacturing method of the wiring board which can ** ** which prevents denting the surface of this resin from the surface of a substrate to be filled up.

[0002]

[Description of the Prior Art]In order to connect each wiring layer conventionally formed in the front and back surfaces of a substrate to be filled up, forming a through hole, plating to the through hole inner skin further, and forming a through hole conductor is performed. In order to face manufacturing such a wiring board and to form a resin insulating layer and a wiring layer good on it, the method of filling up with and making up for resin paste is known (refer to JP,H5-28919,B).

[0003]However, when the resin paste which carried out stopgap restoration was stiffened and filling resin was formed, filling resin might be dented rather than the surface of the substrate to be filled up. Thus, filling resin is dented because what is called bleeding out where whose quantity of the resin paste in a through hole resin paste mobilizes with heating at, and is damp and spreads along the surface of a substrate to be filled up, and decreases occurs. For this reason, if resin paste is stiffened as it is, a dent will occur. When there is cure shrinkage of resin paste, it is thought that a dent is promoted by the cure shrinkage.

[0004]For this reason, in order to make flat the portion indented rather than the substrate to be filled up, the portion applied and dented needed to be filled up with resin paste, it needed to be heated again, and the newly applied resin paste newly needed to be stiffened. After this, the ready side of the hardened filling resin is carried out by polish so that the surface of a substrate to be filled up may become flat-tapped. That is, in such a manufacturing method, since resin paste must be printed twice for restoration of a through hole and a resin curing process must also be further performed twice in connection with this, there are many working strokes and, as a result, they serve as a cost hike of a wiring board.

[0005]It turned out that the dent produced by the above-mentioned bleeding out is most notably generated in the outermost periphery of the through hole formation area in which two or more through holes are formed. If there is an adjoining through hole, with the resin paste which oozed out from the adjoining through hole, It is because the quantity of the resin paste in which the through hole which adjoins from one through hole to the quantity of the resin paste oozing out being restricted oozes out in the through hole of few outermost peripheries in a through hole formation area will increase and a dent will become large as a result.

[0006]This invention is made in view of this present condition, and the through hole formed in the substrate to be filled up is filled up with resin paste, When filling a gap, printing resin paste and carrying out heating hardening, the surface of filling resin in a through hole can be prevented from denting rather than the surface of a substrate to be filled up, and it aims at providing the manufacturing method of the printed circuit which can be manufactured inexpensive by that of reducing a process of operation.

[0007]

[Means for solving problem]While the solving means is filled up with resin paste in the above-mentioned through hole from the process of forming two or more through holes which penetrate between the surface and the back in the through hole formation area of the substrates to be filled up, and the above-mentioned surface side and carries out stopgap printing, [a solving means] It is a manufacturing method of the wiring board which the above-mentioned dummy printing part's surrounding the above-mentioned through hole formation area at least including the process of printing the above-mentioned resin paste and the same resin paste, and forming a dummy printing part on the above-mentioned surface, and forming.

[0008]In the process of carrying out stopgap printing of the resin paste in a through hole according to this invention, A dummy printing part is formed so that the outermost periphery of the through hole

formation area which the through hole which is the original purpose is not only filled up, but surrounds a through hole formation area, namely, a dent tends to generate may be adjoined. Therefore, after carrying out stopgap printing of the resin paste, even if it carries out heating hardening of the resin paste, the surface of resin in a through hole is not dented rather than the surface of a substrate to be filled up.

[0009]Bleeding out is mainly the cause and it is further considered that the cure shrinkage of resin also promotes a dent that the dent produced on the surface of the hardened filling resin conventionally, as mentioned above. However, in order to print resin paste beforehand and to form the dummy printing part in this invention so that a through hole formation area may be surrounded among substrates to be filled up, The resin paste with which the resin paste of the dummy printing part was also damp, and spread at the time of heating, especially the through hole of the outermost periphery of a through hole formation area was filled up is damp, and broadening is controlled. As a result, reduction of the resin paste in a through hole is controlled. For this reason, even if filled resin paste carries out cure shrinkage, the surface of filling resin in a through hole is not dented rather than the surface of a substrate to be filled up.

[0010]In order for the surface of filling resin to fill up and make flat space dented and made rather than the surface of the substrate to be filled up like before, it becomes unnecessary therefore, to apply resin paste again and to carry out heating hardening again. For this reason, since it can skip resin paste printing processes and one process of resin paste curing processes at a time conventionally, respectively, a wiring board can be manufactured inexpensive.

[0011]Here, the substrate to be filled up is just a substrate provided with the through hole penetrated at the back from the surface to be filled up, may be a substrate of a monolayer to be filled up, and may be a substrate which laminated the insulating layer of two or more layers to be filled up. May use this substrate to be filled up after filling resin formation as a wiring board in which electronic parts, such as an IC chip, are carried as they are, and, [a substrate] What laminated the insulating layer and the wiring layer further on this may be used as a wiring board in which electronic parts, such as an IC chip, are carried, using this substrate to be filled up as what is called a core substrate.

[0012]As a formation method of a through hole, the method of forming a through hole conductor in the inner circle wall of a through hole by plating etc. being carried out by, for example, mentioning the method of punching by drill, laser, etc. can be used.

[0013]As for a resin paste printing restoration process, it is preferred to prepare the mask for printing in which two or more bores corresponding to the position of the through hole and two or more bores for forming an island-shape paste were formed, to lay this on a substrate to be filled up, and to print resin paste from on the. It is because restoration to the through hole of resin paste and formation of a dummy printing part can be easily performed by using such a mask.

[0014]Be [what is necessary / just although resin paste can make up for a through hole], what is a coefficient of thermal expansion comparable as the coefficient of thermal expansion of a substrate to be filled up is preferred. It is because generating of thermal stress can be lessened. As mentioned above, in order to control denting the surface of filling resin in a through hole from the surface of a substrate to be filled up in the case of a resin curing process, what has few heat-curing contraction is good. What could make inorganic powder, such as silica and alumina, mix, made the end of conducting powder, such as Cu powder and Ag powder, contain further, and gave conductivity into resin paste may be used. To use a conductive thing for resin paste, the through hole conductor of a through hole inner wall side is not necessarily required.

[0015]After a resin curing process is processed so that the surface which comprises resin may be ground as usual and the surface of a through hole and the surface of a substrate to be filled up with which it was filled up may become flat-tapped. Then, an insulating layer is laminated, further, a wiring layer can be formed on it, two or more layers can be laminated if needed, and a multilayer interconnection board can be manufactured.

[0016]When the surface uses the substrate covered by the metal layer to be filled up, the above-mentioned polish is performed after a resin printing restoration process and a resin curing process, and a wiring layer is formed in a substrate face to be filled up with an etching method etc. after that. For example the substrate with which the surface was covered by the metal layer to be filled up prepares a double-sided copper-clad board, forms a through hole, and is formed by performing electroless deposition and electrolytic plating all over a substrate including a through hole inner wall side.

[0017]Namely, the process of forming two or more through holes where this invention penetrated between the surface and the back, and the conductor layer was formed in inner skin in the through hole formation area of the substrates to be filled up, While being filled up with resin paste in the above-mentioned through hole and carrying out stopgap printing from the above-mentioned surface side, The above-mentioned dummy printing part contains the manufacturing method of the wiring board which surrounding the above-mentioned through hole formation area at least, and forming including the process of printing the same resin paste as the above-mentioned resin paste, and forming a dummy printing part on the above-mentioned surface.

[0018]The above-mentioned dummy printing part may surround a through hole formation area by one printing departments, such as frame shape, and may surround it by two or more printing departments, for example. As a form surrounded by two or more printing departments, what each becomes from two or more island-shape resin paste groups, such as circular, an ellipse form, and a polygon, is mentioned. Each of this island-shape resin paste has a preferred thing of an effective area product smaller than an effective area product of a through hole. For this reason, a bore provided in a mask for printing is good to provide a bore of an effective area product smaller than an effective area product of a bore for through hole printing restoration, and to use for printing of island-shape resin paste.

[0019]The above-mentioned dummy printing part is good for density of a through hole to form also in a field of a non-dense in in the above-mentioned through hole formation area. Since the amount of outflow of resin paste for density to fill up with a field of a non-dense to a through hole increases when density of a through hole arises in a through hole formation area according to a design in a field of a non-dense, a dent of filling resin may produce. On the other hand, in a through hole field, it is good for density of a through hole to form a dummy printing part also in a field of a non-dense.

[0020]

[Mode for carrying out the invention]Hereafter, an embodiment of this invention is described, referring to a figure. A top view seen from the surface of the substrate 1 which makes substantially plate-shaped with plain-view substantially rectangle-shaped to be filled up is shown in [drawing 1](#), and the partial expanded sectional view is shown in [drawing 2](#). This substrate 1 to be filled up is provided with the through hole 3 of a large number which penetrate the surface and the back in the through hole formation area 2. The through hole conductor 4 was formed in an inner wall side of this through hole 3, and the metal layers 5 and 5 of the surface and the back (not shown) are electrically connected mutually.

[0021]This substrate 1 to be filled up drills the through hole 3 in a prescribed spot of a double-sided copper-clad board where copper foil was stuck on up-and-down both sides of BT (bismaleimide triazine)

board with a drill, Then, unelectrolyzed copper plating and electrolysis copper plating are performed to an inner wall side of the through hole 3, and the surface of copper foil of the upper and lower sides, and it is formed in them. Thereby, the through hole conductor 4 is formed in a through hole inner wall side. [0022]The metal mask 6 made from stainless steel (100 micrometers in thickness) in which the bore 8 (opening diameter $\phi 300$ micrometer) for dummy printing parts for forming the bore 7 (opening diameter $\phi 525$ micrometer) for stopgap and the dummy printing part 9 mentioned later corresponding to each through hole 3 of this substrate 1 to be filled up was formed is prepared. And as shown in [drawing 3](#), in a resin printing restoration process, this mask 6 is laid on a substrate to be filled up, and resin paste is printed from on that. In this printing, to the through hole 3, at the same time as it carries out stopgap restoration of the resin paste 10, the dummy printing part 9 is printed.

[0023]Then, if the metal mask 6 is removed, as shown in [drawing 4](#) and [drawing 5](#), the through hole 3 is filled up with the resin paste 10, respectively so that the part may project from the surface of the substrate 1 to be filled up. In approximate circle shape, in the surface of the substrate 1 to be filled up, the dummy printing part 9 of approximately hemisphere-like island shape surrounds the through hole formation area 2, and a printing surface product is printed. [Drawing 4](#) shows a top view of the substrate 1 to be filled up, and [drawing 5](#) shows a partial expanded sectional view of the substrate 1 of [drawing 4](#) to be filled up.

[0024]The gap between through hole 3 arranges this dummy printing part 9 also to the field of a non-dense in a through hole formation area. The mutual gap of each through hole 3 is large, and the dummy printing part 9 is formed in the place where other through holes 3 do not exist near less than 1 mm of the gaps from the through hole 3 of 1 near the through hole 3 of 1. In this embodiment, although the dummy printing part 9 of two rows was formed in the outer circumference of a through hole field, it may be not only this but one row, and the dummy printing part of three or more rows may be provided if needed.

[0025]next, resin curing process **** -- the substrate 1 to be filled up is heated for 20 minutes at 120 **, and the resin paste 10 and the dummy printing part 9 are stiffened (refer to [drawing 6](#)). At the time of this heating, it once mobilizes, and tries to get wet and spread along the surface of a substrate to be filled up, and the resin 11 covers the surface of the substrate 1 to be filled up, and the resin paste 10 and the dummy printing part 9 are filled up with the through hole 3. Under the present circumstances, at this embodiment, since the density of the outside of the through hole formation area 2 and the through hole 3 in the through hole field 2 formed the dummy printing part in the portion of a non-dense, the surface of the substrate 1 to be filled up will be immediately covered only by the resin 11 being slightly damp and spreading. Therefore, the resin 11 with which the dent was generated and filled up also in the portion with low through hole density in the through hole of the outermost periphery of the through hole field 2 which a dent tended to produce, and the through hole field among the through holes 3 is in the state where it fully projected rather than the surface of the substrate 1 to be filled up, conventionally. Thus, even if the resin 11 hardens [in the bleeding out which had become a problem conventionally] for a control **** reason, the surface will be dented rather than the surface of a substrate to be filled up. For this reason, in order to make up for the space depressed rather than the surface of the substrate 1 to be filled up, resin paste can be applied again, and it is not necessary to perform a resin curing process again, and can manufacture that much inexpensive.

[0026]Then, as polish and buff polish according resin on the substrate 1 to be filled up to a belt sander perform final polishing, ultrasonic cleaning removes grinding waste etc. and it is shown in [drawing 7](#),

The surface of the substrate 1 to be filled up and the filling resin 12 in each through hole 3 become flat-tapped, and it is processed so that the metal layer 5 may be exposed to the whole surface.

[0027]Next, with a publicly known etching method, the metal layer 7 which has covered the surface of the substrate 1 to be filled up is processed, and the wiring layer 15 of a prescribed pattern is formed (refer to [drawing 8](#)). A wiring board (not shown) is completed using a publicly known build-up construction method, such as laminating an insulating layer and also forming a wiring layer on it after that, if needed. In this embodiment, the dummy printing part 9 consists of resin paste of island shape, and since it is a diameter $\phi 100\text{--}350\text{micrometer}$ approximate circle form, the aversion to a model at the time of removing the mask 6 is very good after printing of the dummy printing part 9. Therefore, it can produce continuously and the yield is high.

[0028]Although it was based on the embodiment and this invention was explained above, this invention is a range which is not limited to the above-mentioned embodiment and does not deviate from the gist, and it cannot be overemphasized that it changes suitably and can apply. For example, after filling up resin with the above-mentioned embodiment, the metal layer 5 was etched, and the wiring layer 15 was formed by it, but before printing resin paste, the metal layer 5 may be etched and the wiring layer 15 may be formed. Two or more through hole formation areas 2 may be formed on the substrate 1 to be filled up. In that case, what is necessary is just to form the dummy printing part 9 so that two or more through hole formation areas 2 may be surrounded, respectively.

[Brief Description of the Drawings]

[[Drawing 1](#)]It is a top view in which starting the embodiment of this invention and showing the state in front of the resin printing restoration process of a substrate to be filled up.

[[Drawing 2](#)]It is a partial expanded sectional view of the substrate shown in [drawing 1](#) to be filled up.

[[Drawing 3](#)]It is an explanatory view showing the resin printing restoration process of starting the embodiment of this invention and printing the resin paste of a substrate to be filled up.

[[Drawing 4](#)]It is a top view in which starting the embodiment of this invention and showing the state after the resin printing restoration process of a substrate to be filled up.

[[Drawing 5](#)]It is a partial expanded sectional view of the substrate shown in [drawing 4](#) to be filled up.

[[Drawing 6](#)]It is a partial expanded sectional view in which starting the embodiment of this invention and showing the state after the resin curing process of a substrate to be filled up.

[[Drawing 7](#)]It is a partial expanded sectional view in which starting the embodiment of this invention and showing the state after the polishing process of a substrate to be filled up.

[[Drawing 8](#)]It is a partial expanded sectional view in which starting the embodiment of this invention and showing the state after wiring layer formation of a substrate to be filled up.

[Explanations of letters or numerals]

1 Substrate to be filled up

2 Through hole formation area

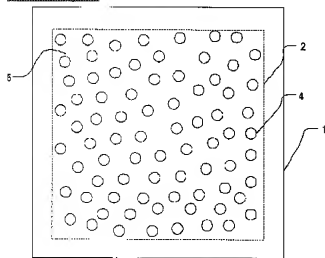
3 Through hole

4 Through hole conductor

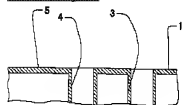
5 Metal layer

- 6 Metal mask
- 7 Bore for stopgap
- 8 Bore for dummy printing parts
- 9 Dummy printing part
- 10 Resin paste
- 11 Resin
- 12 Filling resin
- 15 Wiring layer

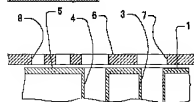
[Drawing 1]



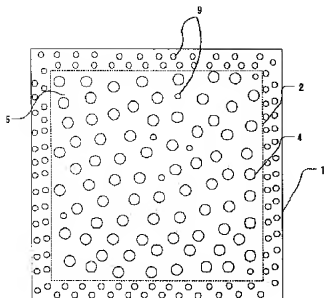
[Drawing 2]



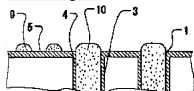
[Drawing 3]



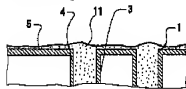
[Drawing 4]



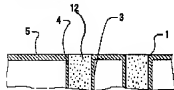
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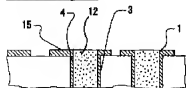
[Drawing 6]



[Drawing 7]



[Drawing 8]



[Translation done.]